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A SUCCESSFUL PARASITE INTRODUCTION INTO BRITISH COLUMBIA

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Since 1925 the lecanium scale *Eulecanium coryli* (L) has been one of the most destructive insects in the coast region of British Columbia. It was introduced accidentally from Europe about 1913. A great variety of hosts are attacked, the chief of these, in order of preference, being: alder, horse-chestnut, maples of several species, hawthorn, mountain ash, laurel, elm and garden roses; a few scales are often to be found on species of *Rubus, Populus, Betula* and *Salix*.

For a number of years the City of Vancouver expended annually nearly $1,000 for control by means of oil sprays. These control operations were successful as far as they went, but as they were of necessity confined to park and boulevard trees, these became continually re-infested from the thousands of acres of native vegetation which it was impossible to spray.

In 1930, the area infested by this scale covered approximately 200 square miles, extending from Vancouver eastward for 20 miles, and for about 5 miles both north and south of that city. It was especially abundant and destructive at the centre of the infestation, and several species of shade and boulevard trees in Stanley Park were only saved by intensive spraying.

PARASITE INTRODUCTION.

The situation became so serious that in 1927 the Dominion Entomologist requested the Imperial Institute (then Bureau) of Entomology to procure parasites of this scale. As a result, in 1928, two shipments of the chalcid fly, *Blastothrix sericea* Dalm. were forwarded from Farnham House Laboratory in England, to the parasite laboratory of the Entomological Branch, then located at Chatham, Ontario. On receipt at Chatham, the material was opened up and the flies were allowed to feed on weak sugar solution for a few hours, then repacked and shipped to British Columbia. The first consignment reached Agassiz on July 17th, and the second on July 21st, having been twenty and sixteen days, respectively, en route.

The specimens were taken immediatly to North Vancouver where they were liberated in two locations about one-half mile apart, a total of 263 flies being released from the two consignments. North Vancouver was chosen in preference to Vancouver on account of the absence of any control operations in that locality.

In 1929 the importation of *Blastothrix* was continued through the parasite laboratory at Belleville, Ontario. Four consignments were received at Agassiz during the period between June 24th and July 27th. These yielded a total of 779 flies which were liberated in North Vancouver.

SPREAD OF THE PARASITE.

The first recoveries were made in June, 1930, when numerous adults emerged from scale material collected from the vicinity of the liberation points. A prompt examination of the infested area in North Vancouver showed that the parasite was abundant as evidenced by the emergence holes in the scales, and had spread a distance of two miles from the liberation points. The percentage of scales parasitized varied from 85% at the liberation points to 1% at the limit of spread. Some twenty square miles of scale infestation now showed the presence of the parasite.

Blastothrix has two generations per year, oviposition occurring first in October with the adults emerging in April. Oviposition takes place again immediately, the second generation adults emerging in June. Their movements during the period between emergence in June and oviposition in October are not known.

This spread, therefore, of two miles had been accomplished in either two or three generations as it was later found that the 1928 liberations had been successful, but the emergence holes had been missed in examinations made during 1929.

To expedite the spread of this parasite to the main areas of scale infestation, material was transferred to Vancouver from North Vancouver early in April, 1931. There was at this time no sign of the parasite in the Vancouver area south of Burrard Inlet. The transfer was accomplished by cutting twigs heavily infested with scale from the parasitized area in North Vancouver; earlier examination under the microscope had shown these to be heavily parasitized. These twigs were collected one week before the parasite was due to emerge. Each twig had from 100 to 200 scales on it. They were tied in bundles of ten, and a bundle placed in the crotch of selected trees in nine different locations in the new unparasitized scale infestation.

Examination of the adult scales in June showed, by the emergence holes, that the adult parasites emerging from the infested twigs had spread as far as two miles when ovipositing. Examination of the larval scales of the new generation in the autumn, showed the presence of the parasite scattered fairly regularly over the entire 150 miles of scale infestation. As the greatest distance between any two colonization points was 14 miles, it was impossible to determine the extreme distance to which the parasite would spread. But seven miles, half the distance between any two liberation points, is very remarkable when we consider that the adult *Blastothrix* is only two millimetres in length.

RESULTS OF PARASITISM.

The percentage of parasitism in the autumn of 1931 as recorded by an officer of the Division of Foreign Pests Suppression, Entomological Branch, ranged from 10 to 80 over the entire scale infestation. In North Vancouver where the original liberations had been made, it ranged from 40 to 95 per cent.

In view of these findings the Vancouver Parks Board were in 1932 advised to relinquish their regular spring spray programme against the host. This step was thoroughly justified, as in the early summer, nowhere were the scales sufficiently numerous to warrant control work being undertaken.

In April, 1932, difficulty was found in collecting sufficient scale material to ship to our Victoria laboratory for liberation at an outbreak of this scale on

Salt Spring Island, and in June with the new generation, it was found quite impossible to fill a further request for material for another island outbreak.

Since 1930, the Division of Foreign Pests Suppression has annually scouted the scale infestation area to observe and record the annual spread, and during these three years some 50 marked trees, within the area and also outside of it, have annually been examined and the number of scales per foot of twig recorded.

In 1930 the counts showed as high as 80 scales per foot of twig in North Vancouver, the average being around 35.

In 1931 the highest count per foot was 45 with an average of 24, while in 1932 no trees showed more than two scales per foot, and many trees heavily infested in 1930 were quite free from any scales. The parasitism of the few adult scales present in 1932 ran from 90 to 100 per cent.

What the permanent result of this introduction will be, it is impossible to predict. The host scale is still present in small numbers, and from observations during the last three years the parasite does not seem to require an abundance of its host to become effective, as the scales on very lightly infested trees have often been found heavily parasitized.

No alternate host is available as far as we know, and the future of this little colonist will, therefore, be watched with interest. In the meantime the residents of Greater Vancouver have been freed from one of their most objectionable and destructive pests.

ADDITIONAL NEW RHOPALOCERA (LEPIDOPTERA)

BY J. D. GUNDER,
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Papilio cresphontes Cram., tr. f. **forsythae** new tr f.

In typical Florida and southern United States examples of *cresphontes*, the ground color is pale yellow. In this tr. f. the ground color is a deep canary yellow, practically an orange or burnt umber, similar to *Papilio rutulus ammoni* Behrens which is well illustrated on pl. 1 of Comstock's "Butterflies of California." This darker ground color is more noticed on the under wing surfaces and extends over the body portions as well. In the types the ♀ is the darker. Classification: Change of Color: chromatism, yellow to orange.

Holotype— ♂, expanse 114 mm., Florida City, Florida, Nov. 21, 1931.

Allotype— ♀, expanse 127 mm., Florida City, Florida, Dec. 4, 1931. Both ex larva. Bred by Mrs. L. E. Forsyth after whom they are named. Types in Author's coll.

Note. The type of tr. f. *maxwelli* Franck represents the initial phase of development under chromatifusism in Change of Pattern which for this species is first indicated by a slight extension of the yellow design in the apical areas of the primaries. Two male examples in the Barnes Coll. show further development, one especially, as regards restriction of design on under side primaries.

Argynnis pfoutsi n. sp.

Upper side. Both sexes in size, in tone of color and in black maculation are very near to *gunderi* Comst., as illustrated in "Butterflies of Calif.", though perhaps a slight shade darker in ground color. *Under side.* Again like *gunderi* (for example, like Ruby Valley, Elko Co., Nevada examples), except that the entire basal area and region around and including the cell, inward from the row

of seven (larger) silvered spots is a deep chestnut-brown color without much trace of yellow ground color showing through. This brown color is deepest in shade next to the silver spotting. The submarginal band is clear yellow, not encroached upon. All examples are silvered and the silvered areas are large, well rounded out. The females are a mere shade lighter than the males which is not unusual in this *Argynnis* group.

Holotype— ♂, expanse 52 mm., Mt. Loafer, nr. Payson, Utah, July 16, 1932.

Allotype— ♀, expanse 57 mm., Payson Canyon, nr. Payson, Utah, July 16, 1932.

Paratypes—2 ♂ and 2 ♀ with similar dates and location; one pair placed in the U. S. National Museum (Barnes coll.), Washington, D.C., and one pair in the Canadian National Coll., Ottawa, Ont. Types in Author's coll., including a long series of topotypes in both sexes. Named after our good friend and ardent field collector, Dr. L. D. Pfouts of Payson, Utah.

Note.—Chitone Edw. is ferruginous (rusty-red) beneath and obscured rear base of wings above. It is related to *hesperis* Edw. and *electa* Edw. *Cornelia* Edw. is a synonym of *electa* according to the restriction of McDunnough in the B. & McD. Contributions, III, 75. (Personally, I have had the thought in mind that the original description of Edwards and the illustrated *electa* 'type' of Holland represented a small *cypris* Edw. occuring in the lowest foothills of the Rockies in "northern Colorado" and eastern Wyoming, for I have some specimens like it from eastern Wyoming, but unfortunately none as yet from the near plains of "northern Colorado." Regardless of the keen ability of Mr. Edwards in the *Argynnis* group he is not here now to correct the disarrangement of his 'types,' so *cornelia* will probably remain a synonym. I have no specimens from the well known collecting regions of Colorado which I would place as *Arg. atlantis beani* B. & Benj.) Holland shows *chitone* ♀ (as 'type') correctly, but it is well to restrict the types to the similar pair in the Edwards collection, in as much as a true pair was adequately described. *Chitone* is illustrated by Comstock on pl. 24 by fig. 7 and fig. 6, though misidentified as *behrensii* Edw. *Utahensis* Skin. is shown on the same plate though misidentified as *chitone* Edw. Utah specimens of *platina* Skin. are nearer *utahensis,* than are the Idaho examples which show a greater constancy as to the greenness of color on their under sides, that being a distinguishing feature of *platina.*

Argynnis semiramis Edw., tr. f. **bernardensis** new tr. f.

Upper sides. Heavy black suffusion of design through limbal area on both wings with trace of submarginal row of buff spots remaining; some buff design through discal area, especially on secondaries, but cell spots on primaries well surrounded with black edging. *Under sides.* Primaries are black suffused repeating upper surface change and the silver spotting is slightly enlarged, tending to inward suffusion, especially those in apical region. On the secondaries the basal area, including the cell is filled with large silver spots, concentrated in this area and completely filling the interspaces; a brownish mottling takes the place of the usual design from these spots outward to the submarginal row of silver spots which are enlarged in thickness. Classification: Change of Pattern; melanifusism, example well developed.

Holotype— ♀, expanse 60 mm., Camp Wasewgan for Boy Scouts, San Bernardino Mts., San Bernardino Co., Calif., July 14, 1932. Type in Author's coll. Its left secondary is damaged. Collected by Mr. John S. Garth of Long Beach, Calif., who is chief entomologist for the Allen Handcock Expedition to the South Seas.

Melitaea neumoegeni Skin., tr. f. **boharti** new tr. f.

Having a conspicuous, large and complete row of oval shaped spots through the discal area on the under side of the secondaries which is represented on the upper side surface by a rather thick irregular line across the wing. Other maculation unchanged. Classification: Change of Pattern; melanifusism, representing a primary phase of *Melitaea* development.

Holotype— ♂, expanse 35 mm., Little Rock, Los Angeles Co., Calif., April 2, 1932. Type in Author's coll. and named after Mr. R. M. Bohart of Berkeley, Calif., who collected the example. *Note*: tr. f. *fridayi* Gun. of this species represents Change of Color.

Plebeius maricopa Reak., tr. f. **windi** new tr. f.

The under side row of spots through the discal area are elongated inwardly, some more so than others, especially on the secondaries. Submarginal row of lunate spots and those in basal areas unchanged. Clasification: Change of Pattern; melanfusism, well developed, but not a final phase.

Holotype— ♂, expanse 33 mm., Berkeley, Calif., April 14th, 1932. Type in Author's Coll. and named after Mr. Robert Wind of Berkeley, Calif., who netted the example.

STUDIES IN THE ELATERIDAE II*

BY W. J. BROWN,
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Conoderus perversus n. sp.

Length 6.2 mm.; width 1.9 mm. Form of *vespertinus* Fab. Head black; pronotum reddish-yellow with an oval median black spot, the spot attaining the apical and basal margins and occupying about three-eights of the pronotal area; scutellum black; elytra reddish-yellow, each elytron with a median blackish stripe; the stripe not quite attaining the base, including the third, fourth, fifth, and sixth intervals in its basal half, a little narrower apically except at apical fourth where it extends almost to the lateral margin, attaining the suture along its apical third; the sutural interval blackish in basal fourth; prothoracic flanks reddish-yellow; prosternum black, a transverse area just behind the lobe and the intercoxal process reddish-yellow; metasternum and posterior coxae black, the median line of the former reddish-yellow; abdomen dark reddish-brown, the apical segment and margins paler; antennae, legs and palpi pale yellow; integuments highly polished throughout, clothed with inconspicuous yellow hairs.

Head coarsely and closely punctate, slightly convex, not impressed. Antenna attaining the base of the posterior pronotal angle; the third segment slightly longer than the second, the second and third together slightly longer than the fourth. Pronotum moderately convex as in *auritus* Hbst.; its width equal to nine-tenths the length of the median line; the side margins feebly arcuate; scarcely

*Contribution from the Division of Systematic Entomology, Entomological Branch, Dept. of Agric., Ottawa.

sinuate before the hind angles; the latter very slender and acute as in *vespertinus*, very feebly everted, each with a single, distinct carina; disk coarsely punctate, the punctures equal in size and separated by distances subequal to or slightly less than their own diameters. Scutellum with the basal portion vertical, obtusely conical in profile.

Elytral striae coarse and deep; intervals strongly convex, rather indistinctly punctulate, not at all rugulose.

Ventral surface coarsely punctate throughout, the punctures sparse on the prosternum, close but well separated elsewhere. Lobe of the fourth tarsal segment small, almost concealed by the fifth segment when viewed from above.

Holotype—Enterprise, Fla., April 26; No. 3380 in the Canadian National Collection, Ottawa.

Paratype—1, same data.

In the paratype, the pronotal spot is a little larger and the underside of the prothorax is dark brown in color. The puncturation of the head and pronotum in this species is like that of *Aeolus mellillus* Say. By this character, and by the maculation of the pronotum, highly polished integuments, and small tarsal lobe, the species may be known from its allies. The tarsal lobe is a little smaller than in *vespertinus* but is wider than in *auritus*.

Conoderus rudis n. sp.

Length 7 mm.; width 2.3 mm. Dorsum very dark brown, the anterior margin of the front and the angles and posterior declivity of the pronotum reddish; the elytra reddish brown at apex, each elytron with a very indistinct reddish-brown, submedian spot, the spot extending over the fifth, sixth and seventh intervals and slightly longer than wide; venter reddish-brown, the metasternum and posterior coxal plates much darker; the antennae, palpi, and legs yellow; body feebly shining.

Head very closely, moderately coarsely punctate; slightly convex; not impressed. Antenna almost attaining the apex of the posterior pronotal angle; the third segment slightly longer than the second, the second and third together slightly longer than the fourth. Pronotum rather feebly convex; the length of its median line equal to nine-tenths its width; widest just before the hind angles, the sides moderately converging and scarcely arcuate to apex, not sinuate before the posterior angles; the latter subparallel, not everted, very acute, each with a single, strong carina which diverges strongly from the lateral margin; disk moderately coarsely, very closely punctate, the punctures separated by much less than their own diameters, the puncturation subobsolete on the basal declivity, the intervals between the punctures very finely alutaceous, subopaque except in apical half at middle. Scutellum strongly convex.

Elytral striae very coarse and deep, very indistinctly punctate; intervals convex, without distinct punctures but very finely rugose.

Prosternum very closely, moderately coarsely punctate; the flanks more finely punctate, very finely alutaceous but shining. Metasternum and abdomen very finely and closely punctate. Lobe of the fourth tarsal segment large, twice as wide as the apex of the segment.

Holotype—Grand Bay, Alabama, Sept. 22, 1928, (O. T. Dean); No. 3291 in the Canadian National Collection, Ottawa.

On account of the similar antennae, tarsal lobes, feebly shining surface, and body form, this species might be mistaken for a small, dark specimen of *aversus* Lec. which is its closest ally. In *aversus,* however, the prothorax above and beneath is very finely punctate, the pronotal sides are very distinctly arcuate, and the posterior pronotal angles are bluntly pointed.

Limonius insperatus n. sp.

Length 7 mm.; width 2 mm. More elongate than *nitidulus* Horn, otherwise similar to the latter in form. Black, the elytra slightly bronzed as in *nitidulus;* the legs brownish-yellow, the femora darker except at their extremities; surface shining, clothed with reddish hairs.

Head coarsely and closely punctate; a very feeble impression extending from each clypeal angle to middle of vertex; clypeus rather strongly produced, the margin truncate, not reflexed. Antennae just attaining the apices of the posterior pronotal angles, very slender; the second, third, and fifth segments equal in length, the fourth slightly longer; the intermediate segments very feebly triangular, fully twice as long as wide.

Pronotum with the width equal to the length, the sides moderately arcuate, the posterior angles not everted, not rounded, as in *nitidulus,* but with the carinae very feebly elevated and indistinct; disk at middle with the punctures rather fine, deep, separated by distances equal to their own diameters; the punctures on the lateral declivities much closer, umbilicate.

Elytra striate and punctate as in *nitidulus.* Prosternum with the punctures coarse, subumbilicate, separated by distances less than their own diameters, the episterna with dense, very coarse, umbilicate punctures; the prosternal sutures strongly excavated anteriorly. Metasternum and abdomen very finely, not closely punctate.

Holotype— ♀, Echo Lake, Tahoe, Calif., July 8, 1915, (R. Hopping); No. 3445 in the Canadian National Collection, Ottawa.

This species is similar to *nitidulus* but differs by characters of the antennae and prothorax. In *nitidulus* the prothoracic sculpture is less coarse and close except rarely in very large females in which the flanks are never as coarsely punctate as in the present species. In both sexes of *nitidulus,* the antennae are much shorter and stouter, and the carinae of the posterior pronotal angles are strongly elevated.

Limonius rudis n. sp.

Female. Length 13 mm.; width 3.5 mm. Less elongate than *griseus* Beauv. but otherwise quite similar to that species in form and also in sculpture and vestiture. Color black; the antennae, prothoracic flanks, and abdomen concolourous, the elytral epipleura yellow near the posterior coxae only, legs brown; vestiture reddish-yellow, prostrate, moderately conspicuous.

Head closely, rather coarsely punctate; the frontal margin depressed at middle. Antennae failing to attain the apices of the posterior pronotal angles by a distance subequal to the length of the last three segments the third segment two-thirds as wide as long, equal in length to the second and three-fourths as long as the fourth.

Width of the pronotum equal to the length of its median line; the pronotal sides parallel in basal three-fifths; the posterior angles scarcely everted, pro-

duced posteriorly, strongly carinate. Disk rather coarsely, closely punctate at middle, the punctures dense but not coarser on the sides.

Elytral intervals rather closely punctate, not rugose. Prothoracic flanks coarsely and densely punctate. Metasternum and abdomen very closely, finely punctate.

Male. Antennae very slightly longer.

Holotype—♀, Bryon, Ont., June 10, 1924, (H. F. Hudson); No. 3446 in the Canadian National Collection, Ottawa.

Allotype—♂, Strathroy, Ont., June 5, 1924, (H. F. Hudson).

Paratypes—1 ♂, Eastern Ontario; 1, Caradoc, Ont., June 24, 1924, (H. F. Hudson); 2, Indiana.

The paratypes measure from 12.5 mm. to 14 mm. and show a little variation in the color of the legs. In all except one from Indiana, the legs are distinctly infuscate. The species is closely allied to *griseus* Beauv. and to *ursinus* Van Dyke. In *griseus* the abdomen and elytra are margined with reddish-yellow, and the legs, antennae, and prothoracic flanks are reddish-yellow. The antennae in *griseus* are much more slender and have the third and fourth segments equal in length, the second being shorter. The antennae of *ursinus* are yellow and a trifle longer and stouter, but otherwise quite similar to those of *rudis*. In *ursinus* the elytral epipleura are pale, the body is much smaller, and the vestiture is whitish in color.

The present species has been labeled *interstitialis* Melsh. in collections. Study of the original description of *interstiltialis* in connection with the ample material at hand convinces me that Melsheimer's species is synonymous with *griseus* Beauv. Fifteen Pennsylvania specimens of the latter, as well as a number of specimens from southern Ontario, are before me.

Agriotes quebecensis n. sp.

Male. Length 10 mm.; width 2.7 mm. Short, robust, and subcylindrical. Blackish, the legs and antennae red; feebly shining; clothed with brownish-yellow hairs.

Head moderately coarsely, very closely punctate. Antennae not quite attaining the apices of the posterior pronotal angles; segments two, three and four equal in length.

Pronotum with its width equal to the length of its median line; the sides parallel except near the angles; the posterior angles long, moderately everted, obtusely carinate; the lateral margin entire; the median line impressed in basal two-fifths; disk rather coarsely, very closely punctate, the punctures not umbilicate.

Elytra with closely punctate striae and finely punctate intervals. Prothoracic venter moderately coarsely, closely punctate; the flanks subopaque, with the intervals between the punctures distinctly alutaceous. Metasternum finely and closely punctate; the punctures of the abdomen very close, a little finer than those of the metasternum. Posterior coxal plates very feebly widened internally.

Median genital lobe similar to the lateral lobes in size and general form and only slightly surpassing the apices of the latter.

Female. Antennae shorter, failing to attain the apices of the posterior pronotal angles by a distance equal to the length of the last two segments.

Holotype—♂, Blackburn, Ont., June 2, 1932, (W. J. Brown); No. 3448

in the Canadian National Collection, Ottawa.

Allotype—♀, same data.

Paratypes—2, Wakefield, Que., May 24, 1929; 6, Knowlton, Que., June 11, 15, 21 and 22, 1927 and 1928, and July 9, 1927, (W. J. Brown and L. J. Milne); 1, Covey Hill, Que., June 27, 1927 (W. J. Brown); 1, South Bolton, Que., June 19, 1928, (W. J. Brown); 1, Ottawa, Ont., (W. Simpson); 1, Ottawa, Ont., June 24, 1914, (G. Beaulieu); 1, Colebrook, Ont., June 22, 1914, (C. G. Hewitt); 1, Merivale, Ont., May 23, 1932, (W. J. Brown); 1, Nova Scotia; 1, Paris, Maine, June 13, 1925, (C. A. Frost).

The paratypes measure from 9.5 mm. to 11.2 mm. in length. In several of them, the elytra are more or less brownish and in the Maine and Covey Hill examples are reddish-yellow as in *limosus* Lec. The lateral margin of the pronotum entire in all the specimens. The present species is confused with *pubescens* Melsh., which is also fairly common in southern Ontario and Quebec, and can be distinguished only by the sculpture of the venter and the characters of the genitalia. In *pubescens,* the lateral pronotal margin is frequently interrupted, the prothoracic flanks are polished like the sternum and without trace of alutaceous sculpture, and the metasternal and abdominal punctures are only a little finer than those of the prosternum. The median genital lobe in *pubescens* is not triangular like the lateral lobes, but is parallel, and therefore wide near the apex, and extends considerably beyond the apices of the lateral lobes.

Agriotes tardus n. sp.

Male. Length 9 mm.; width 2.5 mm. Body moderately robust as in *ferrugineipennis* Lec. Black, the posterior angles of prothorax and the elytra reddish-yellow, the antennae and legs reddish-brown; feebly shining; clothed with yellow hairs.

Head with coarse, close, umbilicate punctures. Antennae not quite attaining the apices of the posterior pronotal angles; segments two and four equal in length, the third segment three-fourths as long as the second or fourth.

Pronotum with its width equal to six-sevenths the length of its median line; the sides parallel except near the angles, converging much more strongly near the anterior angles than in *ferrugineipennis;* the posterior angles long, moderately everted, distinctly carinate; the lateral margin entire; the median line impressed in basal fifth; disk with coarse, close, umbilicate punctures, the punctures a little closer on the sides but separated throughout by distances much less than their own diameters.

Elytra with the striae closely punctate; the sculpture of the intervals subgranulate, more strongly so near the base. Prothoracic venter moderately coarsely punctate; the punctures on the sternum deep, moderately close, on the flanks very close, umbilicate; the flanks very finely alutaceous, subopaque. Metasternum and abdomen rather finely and very closely punctate. Posterior coxal plates strongly widened internally, twice as wide at the trochanters as at their external extremities.

Female. Antennae shorter, failing to attain the apices of the posterior angles by a distance subequal to the length of the last two segments.

Holotype—♂, Crow's Nest Pass, Alta., June 9, 1930, (J. H. Pepper); No. 3463 in the Canadian National Collection, Ottawa.

Allotype—♀, Trinity Valley, B. C., June 6, 1929, (J. R. Howell).

Paratypes—2 ♀, same data as allotype; 2 ♀, same data, June 25, 1929, and May 19, 1928; 1 ♀, McNab Creek, Howe Sound, Vancouver, B. C., June 19, 1930, (H. Leech); 1 ♀, Waterton, Alta., July 10, 1930, (F. S. Carr); 2 ♂, Red Pass, B. C., August 7 and 8, 1932, (G. Stace Smith).

The paratypes measure from 10 mm. to 10.5 mm. in length and show some variation in color. In four of them, the pale prothoracic markings extend forward so that the entire lateral margins of the pronotum and the flanks are reddish-yellow. In two specimens, the flanks are entirely and the pronotal sides are broadly reddish-yellow.

The species is confused with *ferrugineipennis* but differs especially by the pronotal sculpture and the antennal characters. In the latter species, the pronotal punctures are deep and not umbilicate, segments two and three of the antennae are equal and each is shorter than the fourth, the elytra are less roughly sculptured, the pronotal sides are much less strongly arcuate anteriorly and the posterior pronotal angles are usually black. In *fucosus* Lec., the antennae are different, resembling those of *ferrugineipennis*.

Agriotes arcanus n. sp.

Male. Length 8.3 mm.; width 2.2 mm. Slender and subparallel, moderately convex. Reddish-brown, the prothorax and metasternum a trifle darker; the legs and antennae paler; the head blackish.

Head moderately coarsely, very closely punctate. Antenna surpassing the apex of the posterior pronotal angle by the length of the terminal segment; the second segment slightly but distinctly longer than the third, these segments together equal in length to the fourth.

Pronotum strongly shining; its width four-fifths as great as the length of the median line; the sides parallel except near the angles; the posterior angles long, feebly everted, finely carinate; the lateral margin entire; the median line feebly impressed in basal third; disk rather finely, very closely punctate; the punctures simple at middle but distinctly umbilicate on the lateral declivities.

Elytra with closely punctate striae, the intervals finely punctate and subrugose. Prosternum rather finely, very closely punctate; the flanks subopaque, not alutaceous but with dense, rather fine, umbilicate punctures. Metasternum and abdomen very finely and closely punctate. Posterior coxal plates rather strongly widened, twice as wide at the trochanters as at their external extremities.

Each lateral genital lobe with the tooth not very distant from the apex of the lobe, the distance on the inner margin of lobe from apex to the point opposite the tooth equal to the width of the lobe through the tooth.

Female. Length 9.8 mm. Body a trifle more robust. Antennae just attaining the apices of the posterior pronotal angles; the fourth segment four-fifths as long as the second and third together.

Holotype—♂, Point Pelee, Ont., June 23, 1931, (W. J. Brown); No. 3447 in the Canadian National Collection, Ottawa.

Allotype—♀, same data.

Paratypes—4, same data; 5, Point Pelee, Ont., June 6, 1929 (G. S. Walley); 5, Leamington, Ont., June 11, 1929, (L. J. Milne); 2, Leamington, Ont., June

27, 1931, (W. J. Brown); 1, Strathroy, Ont., May 1926, (H. F. Hudson); 1, Western Ontario; 1, Sioux City, Iowa, August, (A. W. Lindsey).

The females are usually slightly larger and more robust than the males. The paratypes measure from 8.3 to 10.3 mm. The species is very closely allied to *oblongicollis* Melsh. and seems to differ only by the pronotal sculpture, the antennae, and the male genitalia. In *oblongicollis,* the pronotum is rather dull because the punctures at middle are umbilicate, scarcely differing from those on the sides; the antennae are longer, surpassing the apices of the posterior angles by the length of two segments in the male and by one segment in the female; the apical portion of lateral genital lobe is much longer, the length being almost twice as great as the width. All specimens of *oblongicollis* which I have seen were taken in Pennsylvania.

Agriotella n. gen.

Body small and subcylindrical. Head convex; mouth inferior; front vertical, separated from the anterior margin of the head by an entire carina which is evenly rounded and which at the middle is situated immediately behind the frontal suture. Antennae rather short, stout very feebly serrate, the first segment large.

Pronotum strongly convex; the sides subparallel, strongly arcuate near the anterior angles, vertical near the margins except at the hind angles, the side margins sharply defined throughout, not becoming ventral but not visible from above near the apex; the hind angles very feebly diverging. Proternum with the lobe short, strongly deflexed; the sutures wide, double, strongly excavated anteriorly. Prosternal process in the same plane as the prosternum, strongly narrowed behind the coxae.

Plates of the posterior coxae strongly but not suddenly narrowed externally, their posterior margins not angulate. Legs slender; the tarsal segments simple, the basal segment subequal to the two following in length.

Type—Elater bigeminatus Rand.

This genus is described for species which have been placed in *Betarmon* Kies. Its type species, on account of the simple tarsi and the position of the frontal carina, cannot be associated with *Betarmon.* It is, however, closely allied to *Athous picipennis* Bach, an European species now placed in *Idolus* Desb. According to European authors, *Idolus breviusculus* Desb., the type of the latter genus, is a synonym of *Drasterius bimaculatus* Rossi, the type of *Drasterius. Idolus* then is not available for *picipennis* and *bigeminatus,* and the new genus seems necessary to include these species, the new species described below, and *Betarmon californicus* Schaef. The International Rules of Zoological Nomenclature are violated by the contention of Mequignon (1930, Bull. Soc. Ent. Fr., 94) who states that *picipennis* must be considered the type of *Idolus.*

Agriotella may be distinguished from its allies by the entire frontal carina which is strongly developed and which, at the middle of the head, is situated immediately behind the frontal suture. The carina is strongly and evenly arcuate and becomes the margin over the antennal base on each side of the head. This structure is similar in *Dalopius* Esch., but there the margins over the antennal bases extend slightly upon the front and then become obsolete, thus leaving the front without a carina. In *Agriotes* Esch. and *Sericus* Esch. the margins over the

antennal bases are directed forward.

The species of *Agriotella* are quite constant in form and general structure. In *picipennis*, segments two, three, and four of the antennae are equal in length. In all of the American species, segment two is slightly longer than three, and segment four is slightly longer than two. The American species may be separated by the following table:

1. Pronotum entirely black, its posterior angles strongly carinate; elytral apex rounded; length 4-6.5 mm. 2
   Pronotum entirely or partly pale, its posterior angles with the carinae feeble or obsolete; elytral apex truncate; length 6.8-8.2 mm. 3
2. Each elytron bimaculate with yellow, the transverse black band separating the spots with a width at least as great as the diameter of the posterior spot; length 4-5.3 mm.; eastern.....*bigeminata* (Rand.)
   Yellow areas of the elytron more extensive; the transverse dark band often absent or obsolete, never with a width as great as the diameter of the posterior spot; length 5.4-6.5 mm; western.....*occidentalis* n. sp.
3. Pronotum entirely yellow; its punctures dense, the intervals between them polished and without sculpture.....*californicus* (Schaef).
   Pronotum maculate with black or with the anterior margin infuscate at middle; its punctures less crowded, the intervals between them not polished, very finely alutaceous.....*columbiana* n. sp.

Agriotella bigeminata (Rand.)

Elater bigeminatus Rand., 1838, Boston Jour. Nat. Hist. II, 37.

Length 4-5.3 mm. Black, the legs and antennae brownish-yellow; each elytron with two large yellow spots which do not quite attain the sutural or lateral margin, the basal spot longer than wide, not attaining the base, the subapical spot subquadrate, the spots varying in size but always large and always separated by a distance at least as great as the diameter of the posterior spot.

Head and pronotum moderately coarsely punctate, the punctures of the head dense, of the pronotum shallow, close, and with the intervals between them alutaceous; the posterior pronotal angles strongly carinate.

Sexual characters. Antennae not quite attaining the apices of the posterior pronotal angles in either sex, very slightly longer in the male. Male genitalia as figured.

Eighty-one specimens from various localities in Ontario, Quebec, New Brunswick, and Nova Scotia are before me. The species was described from Cambridge, Massachusetts.

Agriotella occidentalis n. sp.

Differs from *bigeminata* in size, elytral coloration, and in the characters of the male genitalia. Length 5.4 mm. Elytra yellow, the extreme base and apex black, each sutural and marginal interval brown, the marginal brown stripe expanded just behind the middle to include the three most external intervals. Genitalia as figured.

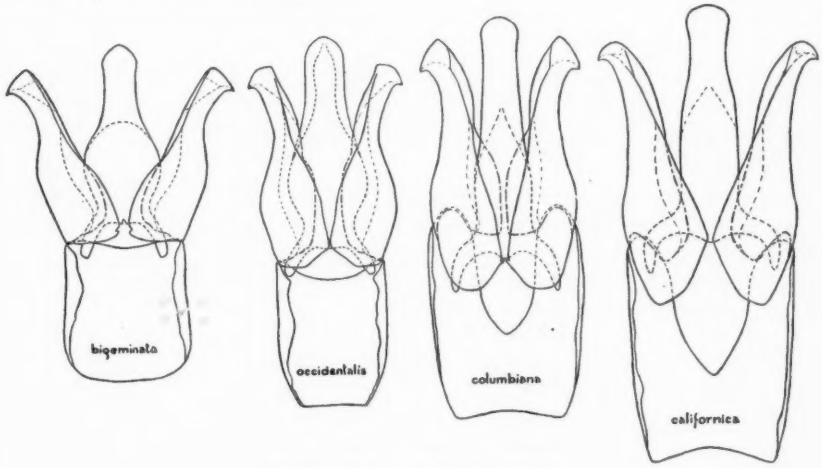
Holotype—♂, Copper Mt., B. C., June 28, 1930, (G. Stace Smith); No. 3276 in the Canadian National Collection, Ottawa.

Allotype—♀, same data.

Paratypes—6, same data as the holotype; 3, same data, April 19, June 25,

and July 7, 1930; 2, Vancouver Island, B. C.; 5, Creston, B. C., May 8, 1930, and June 4, 5, 20, and Sept. 26, 1931, (G. Stace Smith); 2, Vernon, B. C., May 11, 1932, (R. Hopping); 1, Pender Harbor, B. C., June 20, 1929, (R. T. Turner); 2, British Columbia; 1, Medicine Hat, Alta., June 15, 1930, (J. H. Pepper); 2, Crow's Nest Pass, Alta., June 9, 1930, (J. H. Pepper); 1, Waterton, Alta., July 17, 1931, (F. S. Carr).

The allotype is similar to the holotype in color. The paratypes measure from 5.6 mm. to 6.5 mm. and show some variation in color. In seventeen of the paratypes, there is an entire, transverse, brown band just behind the middle of each elytron. This band is sometimes indistinct, and in all the specimens, its width is much less than the diameter of the posterior yellow spot which it limits. The band is obsolete in the other paratypes. Paratypes are deposited in the collections of Mr. Smith and Mr. Carr.



AGRIOTELLA MALE GENITALIA

Agriotella californica (Schaef.)

Betarmon californicus Schffr., 1917, Bull. Brook. Ent. Soc. XII, 42.

Length 7-8.2 mm. Head, venter except the pronotal flanks, antennae, and legs, black. Pronotum and elytra very pale reddish-yellow; the pronotum never infuscate anteriorly or maculate; each elytron usually with the sutural interval infuscate or blackish, this sutural stripe rarely extending upon the second interval, often with the extreme base and apex and sometimes with lateral margin in apical third blackish; these dark areas not sharply limited and not conspicuous; the prosternum rarely reddish.

Head and pronotum densely punctate, the punctures separated by very narrow ridges; the ridges not more than one-fourth as wide as the punctures, polished and without trace of sculpture; the posterior pronotal angles feebly carinate.

Sexual characters. Antenna surpassing the posterior pronotal angle by a distance equal to half the length of the apical segment in the male, failing to attain the angle by a distance equal to the length of the last segment in the female. Male

genitalia as figured.

I have seen eleven specimens from Sequoia National Park, California, from the collection of Mr. A. T. McClay and one specimen labeled Tulare County, California, the type locality of the species.

Agriotella columbiana n. sp.

Male. Length 7.3 mm.; width 2.2 mm. Head and venter except the prothoracic flanks black; elytra with the extreme base, the first and second intervals, and the apical two-fifths, black; a spot on apical margin of pronotum, legs, and antennae, brown; the prothoracic flanks and remainder of pronotum and elytra reddish-yellow; body moderately shining.

Head and pronotum moderately coarsely punctate, the punctures of the pronotum quite close but many of them separated by distances equal to half their own diameters, the intervals between the punctures very finely alutaceous, this pronotal sculpture as in *bigeminata;* the posterior pronotal angles finely and feebly carinate.

Elytra as in *californicus,* with the striae closely punctate and the intervals roughened, the apices truncate. Prosternum shining, closely and moderately coarsely punctate, the flanks densely punctate. Metasternum and abdomen finely and closely punctate.

Male characters. Antenna failing to attain the apex of the posterior pronotal angle by a distance subequal to the length of the apical segment. Genitalia as figured.

Female. Antenna failing to attain the apex of the posterior pronotal angle by a distance equal to the length of the last two of its segments.

Holotype—♂, Genoa Bay, Duncan, B. C., June 19, 1928, (W. Mathers); No. 3465 in the Canadian National Collection, Ottawa.

Allotype—♀, same data.

Paratypes—2♀, same data; 1♂, 4♀, Tahoe, California, July 7, 1915, (R. Hopping); 1♂, 1♀, Mt. Tallac, Tahoe, California, April 30, 1930, (A. T. McClay); 1♀, Fallen Leaf Lake, Lake Tahoe, California, June 20, 1930, (A. T. McClay).

In one of the Californian paratypes, the dark spot of the pronotum attains the base and is extended to occupy half the area of the disk. In five of the paratypes, the spot is reduced and occurs as a small but distinct infuscate area at the anterior margin of the pronotum as in the holotype and allotype. The spot is intermediate in other specimens. In several of the paratypes, the sutural stripe of the elytra extends upon the third intervals, and in most of the specimens, the apical dark area of the elytra is smaller, occupying the apical third or fourth. The paratypes measure from 6.9 mm. to 7.3 mm. in length.

In this species, the pale areas of the body are more reddish and the dark areas more extensive than in *californicus.* The species differs also in the length of the antennae, in pronotal sculpture, and in the form of the apices of the lateral lobes of the male genitalia. Paratypes are deposited in the collections of Mr. McClay and Mr. Hopping.

A NEW OAK APHID FROM MASSACHUSETTS

BY FORREST W. MILLER

Department of Zoology, University of Pittsburgh.

Patchia winforii new species.

Alate viviparous female. (Figs. A-F)

Size and general color:—Length from vertex to tip of anal plate, 1.88. Head and thorax black, lateral portions of prothorax often a deep brown. Abdomen deep brown to black with black dorsal and lateral bands. Cornicles light brown. Cauda rounded, dark brown to black; anal plate black, bilobed, deeply cleft. Antennae with segments I and II concolorous with head; III to VI light brown with tips dusky. Metathoracic legs black; prothoracic legs light brown except proximal half of tibia which is black; mesothoracic leg, femur and proximal half of tibia dark, remainder light brown; all tarsi light brown. Beak yellowish brown at base shading to dark brown at apex. Stigma of forewings black; veins of both the fore wing and hind wing with wide brown fuscous border, entire wing covered with scale-like structures. Fore wings with the radial sector slightly lighter than the other veins; hind wing with both the media and cubitus present. None of the veins reach the border of the wing.

Head and appendages:—Averages width of head across eyes, .448mm. Comparative antennal lengths as follows: III—.270-.276mm., average .273mm.; IV—.205-209mm., average .207mm.; V—.169-.173mm., average .172mm.; VI—.112-.117mm., average .115mm. plus .068-.070mm., average .069mm. Secondary sensoria confined to third antennal segment, arranged in a straight row, numbering from five to six, usually six. There is a single large sensorium at the apex of both the fifth and sixth segments. Segments three to six imbricated. Beak reaching to the mesothoracic coxae.

Thorax and appendages:—Prothorax with one pair of well developed lateral tubercles. Stigma of fore wing bluntly pointed with a row of from eight to ten hairs along the posterior margin. Second fork of media .5 distance of first fork from apex of the wing.

Abdomen:—Cornicle .02 long, slightly greater in width, truncate, faintly imbricated. Cauda .069mm. long, rounded, and with long (.062mm.) hairs. Anal plate deeply cleft and with hairs slightly longer than those of the cauda.

Apterous viviparous female. (Figs. G-H).

Size and general color:—Average length from vertex to tip of anal plate, 1.656mm. Color of head, thorax and abdomen dark brown to black. Cornicles light brown. Cauda and anal plate dark brown to black. Antenna light, except for distal half of segments III to VI which are dark. Beak light with apical portion dark brown. Legs black, except the distal half of the tibia of each pro- and mesothoracic leg which is light brown.

Head and appendages:—Average width of head across eyes, .460mm. Comparative antennal lengths as follows: III—.237-243mm., average .241mm.; IV—.157-.164mm., average .161mm.; V—.168-.174mm., average .172mm.; VI—.115 plus .057mm. Secondary sensoria absent except for the terminal ones on the fifth and sixth segments. All segments with prominent hairs; segments from three to six imbricated. Rostrum extending to mesothoracic coxae.

Thorax:—Prothorax with a small pair of lateral tubercles.

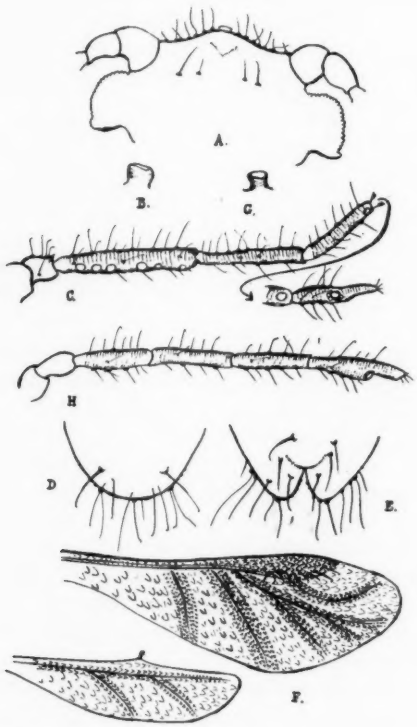
Abdomen:—Cornicle .024mm. in length otherwise as in alate female. Anal

plate and cauda also as in alate viviparous female.

Type locality: Woods Hole, Massachusetts.

Types: Holotype, alate viviparous female taken on *Quercus palustris* from July 10, 1932, to September 1, 1932 (770-32-WH). Morphotype, apterous viviparous female, Woods Hole, Massachusetts, same data as the alate viviparous type. Type collected by the author.

Notes:—This species suggests a close relationship with *Patchia obscura*, Tissot, but may be separated from it by the fact that segment III of the antenna is shorter and both the base and unguis of VI are longer than *P. obscura;* greater number of sensoria on III; vertex of head much more pronounced; wings more heavily covered with scale-like structures; anal plate more deeply cleft and general body color much darker. Also this form congregates in thick clusters on the twigs and stems of the leaves.



Figs. A to F. Alate viviparous female.

A, Head; B, Cornicle; C, Antenna; D, Cauda; E, Anal plate; F, Wings (primary and secondary).

Figs. G and H.—Apterous viviparous female.

G, Cornicle; H, Antenna.

PRELIMINARY STUDIES OF INSECT PARASITES IN INDIANA[1]

BY B. ELWOOD MONTGOMERY,
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This list is based mainly upon parasites reared from field collected material while the author was working at the Bedford Entomological Laboratory of the Purdue University Agricultural Experiment Station during the summer of 1931. Special attention was given to Lepidopterous stem-borers and leaf rollers likely to be found near peach orchards. Several other records, obtained from specimens in the collection of the author, have been included. All records without indication of the year are for the 1931 season.

The attempt by state and federal entomologists to control the Oriental peach moth (*Grapholitha molesta* Busck) by the use of parasites renders it imperative that we know what native parasites have or may attack this pest. Because of the scarcity of the peach moth in 1931 no attempts to parasitize larvae of this species by means of parasites reared from other hosts could be made. Any parasite of a stem-borer or leaf roller may be considered a potential parasite of peach moth larvae.

As this list is intended to serve as a basis for more extensive studies in the future rather complete data on percentage of parasitism, dates of emergence of hosts and parasites, abundance of each, etc., are included. Some information concerning species of Lepidoptera reared in the course of this study, from which no parasites were obtained is also included.

In this preliminary study time was not available to work out the relationship of all the insects involved and some of those listed under any host may have been secondary parasites, inquilines or even parasites of other insects present in the plant material, although reasonable care was taken to separate and cage each recognizable species separately.

The parasites and such Lepidoptera as were not well known to the author, were sent to Dr. Harold Morrison, in charge of the taxonomic unit of the Bureau of Entomology for determination by specialists of the Bureau and the National Museum. The determinations were made by F. H. Benjamin, Carl Heinrich and August Busck (Lepidoptera), C. F. W. Muesebeck and R. A. Cushman (Hymenoptera) and J. M. Aldrich (Diptera).

The numbers accompanying the specific names of Lepidoptera are those of Barnes and McDunnough's Check List of the Lepidoptera of Boreal America.

18. *Papilio troilus* Linn. Larvae of this butterfly in rolled sassafras leaves were collected at Poseyville, Vincennes and Bedford and reared to the adult stage, but no parasites were obtained.

766. *Samia cecropia* Linn. A specimen of *Eremotylus macrurus* (Linn.) was obtained in May, 1932, from one of a number of cocoons of *S. cecropia* collected at LaFayette early in the spring.

774. *Telea polyphemus* Cram. A specimen of *Eremotylus macrurus* obtained April 26, 1932, from a cocoon of this species collected at Martinsville earlier in the year and 49 specimens of *Spilochalcis mariae* (Riley) which emerged April 24, 1932, from a cocoon collected at Remington were furnished me by L. I. Musgrave.

[1]Contribution from the Department of Entomology, Purdue University, Agricultural Experiment Station.

1490. *Lycophotia saucia* Hbn. Early in June, 1931, cutworms were abundant in sweet clover in an apple orchard near Orleans, where codling moth experiments were being conducted. A number of cutworms of varying sizes, most of them showing signs of parasitism, were collected June 10. Most of these larvae entered the soil of the rearing cage at once but a few remained active for a few days eating sweet clover leaves. Some were noted to die of disease. A moth emerged in this cage June 30, and the following parasites appeared between June 22 and July 7: *Rogas terminalis* (Cress.)—1, *Winthemia rufopicta* Big.—8, *Archytas apicifera* Walk.—2.

Parasites were emerging from the body of one of the larvae collected June 10. This larva was lost in transit to the laboratory but part of the silken mass of parasite cocoons was retained and four specimens of *Apanteles xylinus* (Say) emerged June 18.

On June 27 the dead body of a cutworm with a hymenopterous cocoon attached and the remains of another which had been almost completely consumed and contained three dipterous puparia were found beneath corrugated paper bands used as codling moth traps. From these, one individual of *Microplitis feltiae* Mues., was obtained June 28, and three of *Voria ruralis* Fallen June 29-30.

2956. *Tarachidia candefacta* Hbn. See No. 6981, *Epiblema strenuana* Walk.

3705. *Hemerocampa leucostigma* S. & A. Twelve specimens of *Astomaspis nanus* (Grav.) were obtained from larvae of the tussock moth feeding on sycamore at Vincennes in July, 1929.

4798. *Thyridopteryx ephemeraeformis* Haw. A number of "bags" containing larvae were collected from willow near Decker, Aug. 30. Although the larvae were still active no attempt was made to provide food; a number of male moths emerged late in September. Twenty-nine parasites, four *Itoplectis conquisitor* (Say) and 25 *Allocota thyridopterigis* (Riley) were obtained Sept. 4—Oct. 4.

4921. *Desmia funeralis* Hbn. A collection of rolled grape leaves, obtained at Poseyville, Aug. 29-30, yielded three moths, two of this species and one of *Sparganothis sulfureana* Clemens, and five parasites, two each of *Dioctes cbliteratus* (Cress.) and *Apanteles canarsiae* Ashm., and one of *Triclistus propinquus* (Cress.), Sept. 4-24.

6109. *Gnorimoschema banksiella* Busck. Three larvae in rolled leaves of hazelnut were collected near Bedford, June 6, and one adult of this species emerged June 22. This is a new host record for this species which is usually a feeder on Solidago.

6116. *Gnorimoschema lavernella* Cham. Four collections of fruit of the ground cherry (*Physalis sp.*) in some of which larvae of this species were feeding were made: near Bedford, July 30 and Aug. 4, near Orleans Aug. 5, and near Mitchell, Aug. 22. Seventeen parasites, determined as *Microbracon n. sp.*, by Muesebeck, were obtained from this material. The following table gives the emergence records for the four collections of infested fruit.

Date of Collection	Number of Fruit	Number of Moths Obtained	Date of Emergence	No. of Parasites	Date of Emergence
July 30	50	27	Aug. 4-Sept. 1	10	Aug. 4-12
Aug. 4	364	21	Aug. 19-31	4	Aug. 7-12
Aug. 5	31	1	Aug. 17	1	Aug. 19
Aug. 22	96	No record		2	Aug. 28-Sept 15

6122. *Gnorimoschema gallaesolidaginis* Ril. About 15 collections of Soldago stem galls caused by this species were secured from June 30 to Aug. 20, inclusive. Although the plant material became quite dry and hard after a few weeks, adult moths were secured from most of the collections, even the first, from which three emerged Sept. 15. The first moths were secured Sept. 3, and emergence continued for about three weeks. These collections, taken in the vicinity of Bedford, yielded the following Hymenoptera: *Eurytoma bolteri* Ril.—21 (July 1-Sept. 23), *Tetrastichus sp.*—9 (July 7), *Platygaster solidaginis* (Ashm.) —1 (July 7, *Microbracon futurus* (Fyles)—8 (July 22-25), *Calliephialtes notandus* (Cress.)—1 (Aug. 21). An example of *E. bolteri* was collected in the field as it was emerging from a gall, June 27. Many of the galls collected after the middle of July contained parasite exit holes and were empty of larvae. In a collection of 109 galls gathered Aug. 20, 42 contained exit holes, seven had been torn open by birds (?) and one was half decayed; none of the 50 contained larvae.

One collection of 22 galls from near Turkey Run State Park July 6, yielded five moths (Sept. 3-24), three specimens of *E. bolteri* (July 8-30) and one of *C. notandus* (July 29).

6284. *Gelechia nundinella* Zell. Larvae of this species were found in gall-like capsules formed of thickened and fused terminal leaves of the bull nettle (*Solanum carolinense* Linn.) in June and in the fruit of the same plant in the latter half of July and throughout August. A quantity of such capsules were gathered near the laboratory June 16; three hosts and six parasites, of which five were *Microbracon gelechiae* (Ashm.) and one *M. mellitor* (Say), emerged from this material, June 21-26. A collection of these capsules was made near Orleans June 17 and from it 17 hosts and 14 parasites, all *M. mellitor*, were obtained June 25-30.

Collections of Solanum fruit infested with the larvae of this species were made near Orleans July 29, Aug. 2 and 21; the following host and parasite emergences were obtained:

Date of Collection	Number of Fruit	Number of Hosts	Parasites	Number
July 29	244	15	*Spilochalcis sp.*	26
Aug. 5	159	24	*Spilochalcis sp.*	2
Aug. 21	several hundred	155	*Spilochalcis sp.*	64
			M. mellitor	1
			Microbracon n. sp.	1
			Eurytoma bolteri Ril.	1

Emergence of both hosts and parasites from all of these collections continued approximately from Aug. 25 to Sept. 24.

A collection of Solanum fruit from near Spurgeon, Aug. 11, gave 12 hosts (Aug. 17-Sept. 15), but no parasites and one of 29 infested fruits from Moores-

ville, Aug. 20, yielded 17 hosts and two parasites, both *Microbracon n. sp.* (Aug. 31-Sept. 24)

6478. *Depressaria heracliana* DeG. Collections of larvae of this species on wild parsnip (*Pastinaca sativa* L.) were made in the vicinity of Bedford in the early part of June and at Brooklyn, July 25 and many hosts were reared but no parasites were obtained.

6811. *Exartema ferriferanum* Walk. Larvae of this insect were found in crumpled leaves of Hydrangea near the laboratory early in June. Four adults, emerging June 9-22, and one parasite, *Itoplectis conquisitor* (Say) (June 25) were obtained.

6873. *Phaecasiophora niveiguttana* Gr. Many collections of rolled leaves of sassafras, containing Tortricid larvae, were made at several localities from June 6 to Aug. 30. Adults of this species were reared in considerable numbers from collections from Bedford, Frichton, Oakland City and Poseyville; emergence of adults was observed from June 22 to Sept. 15., although variation in the number of larvae in the field, indicating rather definite broods, was noted. Only four parasites were obtained from this material—two specimens of *Microgaster ecdytolophae* Mues., June 22, from a collection made June 6, another of the same species from a collection made June 9, and one of *Zenillia caesar* Ald., July 3, from a collection of June 16, all from Bedford. One example of *Argyrotaenia velutinana* Walk., was reared from the collection of June 6.

6981. *Epiblema strenuana* Walk. Considerable attention was given to the parasites of this species since previous work (1) has shown that it serves as a host for several parasites of the Oriental peach moth. The larvae bore in the stem of the common ragweed (*Ambrosia artemisiifolia* L.) killing the terminal growth and causing a characteristic whorl of branches arising at the level of the point of attack.

Collections of Ambrosia stems containing larvae, apparently of this species were made from July 1 to Aug. 20 in several localities. With the exception of one example of *Tarachidia candefacta* Hbn., emerging Sept. 5 from a collection made near Farmersburg, July 6, all Lepidoptera obtained from these collections belong to this species. Ragweeds growing in grain stubble were found to be infested but lightly, if at all, but those growing in fence rows, road sides, uncultivated orchards and similar places almost always showed a relatively high infestation.

It was not possible to keep stems, especially those collected during the early part of the summer, in a condition at all comparable to those in which the larvae normally feed and little success was obtained in attempts to transfer larvae to fresh stems.

Eleven collections of infested Ambrosia stems were made in the vicinity of Bedford, July 1, 10 and 28, Aug. 1, 4, 12, 14 (2) and 20 (3). No emergence of hosts or parasites was obtained from the first two of these; one host was obtained Aug. 8 from the third collection. The remaining collections yielded hosts and parasites as follows:

[1]Allen, H. W. and Earl Lott, 1930, Proc. Ent. Soc. Wash., 32, (7) :135-136.

Date of Collection	Hosts	Date of Emergence	Parasites	Number	Date of Emergence
Aug. 1	2	Aug. 1-Sept. 1	*Macrocentrus delicatus* Cress	4	Aug. 28-Sept. 29
			Glypta rufiscutellaris Cress	1	Aug. 28
			Cremastus minor Cush.	1	Sept. 4
Aug. 4	2	Aug. 14-17	*G. rufiscutellaris*	1	Aug. 14
			Pristomerus ocellatus Cush.	1	Aug. 17-Sept. 24
Aug. 12	0		*M. delicatus*	2	Sept. 5-Oct. 2
Aug. 14	2	Aug. 31-Sept 2	*M. delicatus*	4	
	4	Aug. 17-31	*M. delicatus*	1	Sept. 24
Aug. 20	30	Aug. 28-Sept. 15	*M. delicatus*	8	Sept. 9-24
	9	Aug. 28-Sept. 15	*M. delicatus*	3	Sept. 2-24
	0		*Microbracon caulicola* Gah.	2	Sept. 9

A collection of infested Ambrosia stems from near Lafayette, July 6, gave no emergence; others from Crawfordsville, July 6, Paoli, July 20, and Bloomington, July 21, yielded only one host each and no parasites. A leaf beetle, *Galerucella notulata* Fab., emerged from the latter collection Aug. 12. A collection from Sullivan, July 6, gave one example of *Lixophaga variabilis* Coq., Aug. 4, and one from Duggar on the same date yielded the following between July 21 and Aug. 25: *L. variabilis* -4, *P. ocellatus* -1, and *M. delicatus* -2. No host was obtained from either of these collections. Two hosts and three parasites, *Bassus simillimus* (Cress.) -1 (Sept. 9) and *M. delicatus* -2, were obtained between Aug. 12 and Sept. 29, from a collection made near Orleans, July 29; one host and the following parasites emerged, Aug. 21 to Sept. 24, from material collected near Mitchell, July 29: *M. delicatus* -4, *C. minor* -1, and *P. ocellatus* -1. Three collections were made in the vicinity of Vincennes Aug. 11; hosts and parasites emerged from this material between Aug. 17 and Sept. 15, as follows: hosts -48, *M. delicatus* -9, *Perilampus sp.* -2, *C. minor* -2, and *P. ocellatus* -1. Two examples of the stem-boring dipteron, *Agromyza virens* Lw., were obtained from one collection.

A collection was made in the Wabash River lowlands west of Princeton, Aug. 10. Much of the land in this immediate vicinity had apparently laid waste for a few years and was covered with a rank growth of ragweeds. The stems collected were quite large and woody. Host emergence continued from Aug. 12 to Sept. 15, and the following parasites emerged between Aug. 19 and Sept. 24: *M. delicatus* -23, *G. rufiscutellaris* -4, *P. ocellatus* -1, *Cremastus epagoges* Cush. -2, and *C. minor* -2.

Several of these collections were made in the immediate vicinity of orchards in which colonies of *Macrocentrus ancylivora* Roh., had been placed during the previous two or three years, but no specimen of this species was obtained.

Attempts were made to parasitize larvae of *E. strenuana* with adults of *M. delicatus* and *G. rufiscutellaris* obtained from peach moth material, but without success. This failure may have been due to the age of the larvae used as the

author has shown in work now awaiting publication that the percentage of parasitism secured by exposing larvae of the peach moth to *G. rufiscutellaris* decreased very rapidly as the age of the larvae at the time of exposure to the adult female parasite for oviposition was increased.

7270. *Carpocapsa pomonella* Linn. During the summer of 1929 large quantities of apples apparently infested with the codling moth were gathered in Knox County, Indiana, Henderson County, Kentucky and Clay County, Illinois and placed in a closed room at Vincennes in order to secure moths for experimental work. Some of the Hymenoptera which emerged in this room were collected and have been determined as follows: *Xenocrepsis townsendi* (Ashm.) -2, *Pachyneuron allograptae* Ashm. -2, *Cirrospiloideus johnsoni* Gir. -1, *Goniozus sp.* -1, *Perilampus chrysopae* Cwfd. -7, *Ascogaster carpocapsae* (Vier) -8, *Helorus paradoxus* (Prov.) -1, and *Cremastus minor* Cush. -1. No attempt has been made to determine which are parasites of *C. pomonella* and which hyper-parasites or parasites of other insects which may have been present in the apples.

7316. *Sparganothis sulfureana* Clem. See No. 4921, *Desmia funeralis* Hbn.

7390. *Argyrotaenia velutinana* Walk. See No. 6873, *Phaecasiophora niveiguttana* Grt.

7731. *Atteva aurea* Fitch. Larvae of the Ailanthus webworm collected at Bedford and Lafayette were reared to adults but no parasites were obtained.

BOMBARDING BEETLES OF THE GENUS DICAELUS AND HARPALUS.

BY P. W. FATTIG.

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On November 3rd, 1928, I collected at Stone Mountain, Georgia, a Carabid beetle—*Dicaelus elongatus* (Bon.)—which gave off a very strong discharge of gas which turned to a dense smoke. This appeared to come from the sides of the thorax, instead of from the posterior end of the abdomen as in the genus Brachynus.

I gave a brief account of this Bombarding Dicaelus beetle on page 193 of the August 23rd, 1929, number of Science. Mr. N. K. Bigelow of New York City wrote me as follows: "During June and July, 1928, while collecting around Vinton, Benton County, Iowa, I took several specimens of *Dicaelus sculptilis* (Say) which had the same habit. In this beetle the volume of smoke was much less than you mentioned and its color appeared to be either a very light blue or almost white. It seemed to come from the sides of the insect's abdomen, and the sound of its emission while faint was distinctly audible." While visiting at the National Museum, Mr. H. S. Barber told me that he had a similar experience with a Dicaelus beetle.

On July 5th, 1932, I placed a *Harpalus caliginosus* (Fab.) in a cyanide jar shortly after I had placed a *Dynastes tityus* (Linn.) and a *Pseudolucanus capreolus* (Linn.) in the jar. The *P. capreolus* was a large male and it caught hold of the *H. caliginosus* beetle, when it gave off a rather large amount of dense smoke. This smoke escaped over a foot from the jar when I uncapped it. This Harpalus beetle was taken near Atlanta. After this experience I collected all of the *H. caliginosus* beetles that I could find. On July 14th I had the same ex-

perience again. This beetle also was placed in the jar just after placing a *P. capreolus* in the jar. This beetle did not give off as much gas as the first beetle.

On July 16th I had the same experience with two more *H. caliginosus*. The discharge of gas was much less than in the two former cases. The first was again placed in the jar with a *P. capreolus*, and the second was placed in with *Phileurus truncatus* (Beauv.). I collected a large number of *H. caliginosus* during the month of July, and these four were the only ones that gave off gas or smoke. Several were placed in the jar along with other large beetles. I thought that possibly the large beetles frightened the *H. caliginosus* beetles and caused them to give off the gas. I could not determine from what part of the body the gas was given off from, as I did all the collecting at night at a Georgia Power Co. sub-station.

I have had several specimens of the genus *Brachynus* to discharge smoke, but in all of these, the smoke appeared to come from the posterior end of the abdomen.

While collecting the Lubberly Walking Sticks *(Anisomorpha buprestoides)* at Gainesville, Florida, I had several mating pairs shoot a whitish substance which looked like white powder while it was in the air, but appeared like milk when it struck my hands. They shot this from the sides of their thorax. They were able to shoot this out for a distance of eighteen inches or more. I only had this experience with the walking sticks during one afternoon. I collected thirty-seven pairs in copulation during a period of about two hours, and had at least a half dozen pairs shoot the white substance at me. I have collected many pairs of the *A. buprestoides* since, but have never had another similar experience with them.

While collecting insects at the Dixie Boys Camp, near Clayton, Georgia, on August 17, 1929, I turned over the bark from an old oak log, and found thirteen pairs of *Anisomorpha ferruginea* in copulation. These also shot out a whitish substance, but the pairs were so close, that I could not detect as to what part of the body the material came from. This material had a strong pungent odor, much like ammonia.

A NEW LYCOSTOMUS FROM MEXICO (COLEOPTERA: LYCIDAE)

BY HOWARD E. HINTON,

Berkeley, California.

Lycostomus nigrofumosus Hinton n. sp.

Smoky black, apical three-fourths of elytra blood red; clothed with moderately dense prostrate pubescence.

Head black, closely, finely punctate, moderately densely pubescent, a wide, deep transverse impression between the eyes; beak pubescent, closely, finely punctate, moderately long, subparallel, half as wide as long at apex; maxillary palpi closely and finely punctate, moderately pubescent, apical joint not twice as long as wide, apex rounded, inner side subangulate; antennae finely, closely punctate, densely pubescent, with a few short, erect, pale hairs scattered irregularly, third joint wider and very slightly longer than fourth.

Prothorax one and a half times as wide as long, coarsely, densely punctate, disk finely punctate; apical carina prominent, one-fifth the total length of the pronotum; a short, indistinct, longitudinal carina at base of prothorax; median channel or suclus wider than deep, about one-half the total length of the prothorax; sides converge slightly toward apex, front angles broadly rounded, hind angles prominent, acute, and very slightly produced.

Elytra costate, reticulate, sparsely pubescent, the alternate costae more prominent; scutellum and basal one-fourth dull black, apical three-fourths blood red, moderately expanded; wings black.

Metasternum sparsely pubescent, sparsely, finely punctate; ventral segments moderately, densely pubescent, closely punctate, last segment (female) lobed at middle, apex of lobe triangularly incised with the angles of the incisure rounded; tibiae only slightly arcuate. Length, 15-17 mm.; breadth, 7-8 mm.

Holotype—Female No. 3688 deposited in the collection of the California Academy of Science and three *paratypes,* all females, in the author's collection. All four specimens were collected in July, 1932, at Real de Arriba, Alt. 6300 ft., District of Temascaltepec, Mexico.

The paratypes are slightly larger than the type, and are also variable as to color, the red apical portion extending on the side to the humerus in one of the specimens. In the specimens before me, the transverse impression between the eyes varies in depth and width as does the sulcus on the prothorax. This species is readily distinguished from all described Mexican and North American species by its distinctive coloration.

BOOK NOTICE

Methods for the Study of the Internal Anatomy of Insects. By Clarence Hamilton Kennedy. Ohio State University, 1932. (103 pp.)

In this work the methods more commonly used in insect dissection, the preparation of whole mounts and of organs and tissues for microscopical study are described in a detailed but concise manner, while special methods for advanced students are given more briefly but with copious references to the published works on microscopical technique, a list of which appears in the concluding section. Among the tropics of special interest to entomologists are the problems of embryological technique, the softening of sclerotized chitin in preparation for sectioning, intro-vitam staining, the injection of tracheae and the staining of the chitinous body-wall of Coccidae and other small insects. Much attention is also devoted to the subjects of apparatus, tools, and methods of illumination, numerous illustrations being given in connection with these and other matters discussed. A very valuable feature of the book, unusual in works on microscopical technique, is the section on drawing and the making of illustrations for publication. By reason of his own masterly skill as a draughtsman, the author is eminently qualified to direct others in this field.

The book consists of fifteen sections and an index. Although written for a special course on the curriculum of the Ohio State University it will be extremely useful wherever instruction in entomology is given.

E. M. Walker

MAILED SATURDAY, SEPTEMBER 2, 1933

Norman Criddle